

Genetic Algorithm for Optimization: Preprocessor and Algorithm

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Abstract Genetic algorithm (GA) inspired by Darwin's theory of evolution and employed to solve optimization problems — unconstrained or constrained — uses an evolutionary process. A GA has several parameters such the population size, search space, crossover and mutation probabilities, and fitness criterion. These parameters are not universally known/determined a priori for all problems. Depending on the problem at hand, these parameters need to be decided such that the resulting GA performs the best. We present here a preprocessor that achieves just that, i.e., it determines, for a specified problem, the foregoing parameters so that the consequent GA is a best for the problem. We stress also the need for such a preprocessor both for quality (error) and for cost (complexity) to produce the solution. The preprocessor includes, as its first step, making use of all the information such as that of nature/character of the function/system, search space, physical/laboratory experimentation (if already done/available), and the physical environment. It also includes the information that can be generated through any means — deterministic/nondeterministic/graphics. Instead of attempting a solution of the problem straightway through a GA without having/using the information/knowledge of the character of the system, we would do consciously a much better job of producing a solution by using the information generated/created in the very first step of the preprocessor. We, therefore, unstintingly advocate the use of a preprocessor to solve a real-world optimization problem including NP-complete ones

before using the statistically most appropriate GA. We also include such a GA for unconstrained function optimization problems.

1. Introduction